INDOOR AIR QUALITY ASSESSMENT

Department of Children and Families
143 Munson Street
Greenfield, MA

Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
June 2017

Executive Summary

Increase fresh air supply, reduce the number of plants and change water damaged ceiling tiles is recommended.

Background

Building:	Department of Children and Families (DCF)
Address:	143 Munson Street, Greenfield, MA
Assessment Requested by:	Cory Thomas, Field Operations, Executive Office of Health and Human Services (EOHHS)
Reason for Request:	General indoor air quality (IAQ).
Date of Assessment:	May 19, 2017
Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:	Mike Feeney, Director, IAQ Program
Building Description:	Square brick building with a flat roof.
Building Population:	Approximately 100 employees.
Year of Construction:	2000s.
Windows:	Not openable

Methods

Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015).

IAQ Testing Results

The following is a summary of indoor air testing results (Table 1).

- ***Carbon dioxide levels*** were above 800 parts per million (ppm) in a about half of the areas assessed, indicating inadequate fresh air in portions of the space.
- ***Temperature*** was within the recommended range of 70°F to 78°F in all areas assessed.

- ***Relative humidity*** was within the recommended range of 40% to 60% in all areas assessed.
- ***Carbon monoxide*** levels were non-detectable in all indoor areas assessed.
- ***Fine particulate matter (PM2.5)*** concentrations measured were below the National Ambient Air Quality Standard (NAAQS) level of 35 $\mu g/m^3$ in all areas assessed.

Ventilation

A heating, ventilating, and air conditioning (HVAC) system has several functions. First it provides heating and, if equipped, cooling. Second, it is a source of fresh air. Finally, an HVAC system will dilute and remove normally occurring indoor environmental pollutants by not only introducing fresh air, but by filtering the airstream and ejecting stale air to the outdoors via exhaust ventilation. Even if an HVAC system is operating as designed, point sources of respiratory irritation may exist and cause symptoms in sensitive individuals. The following analysis examines and identifies components of the HVAC system and likely sources of respiratory irritant/allergen exposure due to water damage, aerosolized dust, and/or chemicals found in the indoor environment.

The assessment results indicate that the ventilation system is providing adequate fresh air for half of the building. Note that many areas had low occupancy which can reduce the creation of carbon dioxide. To maximize air exchange, the BEH recommends that mechanical ventilation systems operate continuously during periods of occupancy. Without the system operating as designed, normally occurring pollutants cannot be diluted or removed, allowing them to build up and lead to IAQ/comfort complaints.

Fresh air is provided by air handling units (AHUs) located on the roof. Air from the AHUs is filtered, heated/cooled, and delivered to rooms via ducted supply vents. Air is returned/exhausted through vents located around lights. Direct exhaust ventilation was present in restrooms and some conference rooms.

It is recommended that HVAC systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994). It was unknown when the last time these systems had been balanced.

Microbial/Moisture Concerns

Stained ceiling tiles were observed in one location (Table 1). Water-damaged ceiling tiles can provide a source of mold and should be replaced after a water leak is discovered and repaired.

Plants were observed in offices (Table 1). Plants can be a source of pollen and mold, which can be respiratory irritants to some individuals. Plants should be properly maintained and equipped with drip pans to prevent water damage to porous materials. Plants should also be located away from air diffusers to prevent the aerosolization of dirt, pollen, and mold. Water coolers, fountains, and small refrigerators were found located in carpeted areas where they can moisten the carpet and lead to microbial growth.

Other IAQ Evaluations

Exposure to low levels of total volatile organic compounds (TVOCs) may produce eye, nose, throat, and/or respiratory irritation in some sensitive individuals. To determine if VOCs were present, BEH/IAQ staff examined rooms for products containing VOCs. BEH/IAQ staff noted air fresheners, hand sanitizers, cleaners, and dry erase materials in use within the building. All of these products have the potential to be irritants to the eyes, nose, throat, and respiratory system of sensitive individuals.

The offices were mostly carpeted. Carpets should be cleaned annually (or semi-annually in soiled/high traffic areas) in accordance with Institute of Inspection, Cleaning and Restoration Certification (IICRC) recommendations, (IICRC, 2012).

In some offices, items such as paper, boxes and decorative items make it harder for custodial staff to clean. Fan blades on personal fans had settled dust and debris, which can be reaerosolized and cause irritation.

Conclusions/Recommendations

Based on observations at the time of assessment, the following is recommended:

1. Increase fresh air supply.
2. Operate supply and exhaust ventilation continuously in all areas during occupied periods.

3. Have the HVAC system balanced every 5 years in accordance with SMACNA recommendations (SMACNA, 1994).
4. Consider having direct exhaust installed in kitchen and copy areas to remove odors and particulates generated in these areas.
5. Repair any water leaks and replace stained ceiling tiles.
6. Keep plants in good condition, avoid overwatering, and avoid placing them on porous items such as carpets or paper.
7. Place refrigerators and water dispensing equipment in areas without carpeting or use a waterproof mat underneath them.
8. Reduce use of cleaning products, sanitizers, and scented products.
9. Clean carpeting in accordance with IICRC recommendations (IICRC, 2012).
10. Reduce stored materials and store in an organized manner to allow for thorough cleaning.
11. Clean supply and exhaust vents and personal fans regularly to prevent aerosolization of debris.
12. Refer to resource manual and other related IAQ documents located on the MDPH's website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: http://mass.gov/dph/iaq.

References

IICRC. 2012. Institute of Inspection, Cleaning and Restoration Certification. Carpet Cleaning: FAQ. Retrieved from http://www.iicrc.org/consumers/care/carpet-cleaning.

MDPH. 2015. Massachusetts Department of Public Health. Indoor Air Quality Manual: Chapters I-III. Available at: http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-manual/.

SMACNA. 1994. HVAC Systems Commissioning Manual. 1st ed. Sheet Metal and Air Conditioning Contractors' National Association, Inc., Chantilly, VA

Location: Department of Children and Families (DCF) **Indoor Air Results**

Address: 143 Munson St., Greenfield, MA **Table 1** **Date: 5/19/2017**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Background (Outdoors)	373		86	40	12					
Meeting room	897	ND	75	45	8	4	N	Y	Y	
Clerical unit	915	ND	74	45	8	1	N	Y	Y	
Area Admin Mgr.	828	ND	74	44	10	0	N	Y	Y	
Area Program Mgr.	821	ND	74	44	9	0	N	Y	Y	Plants
Unit A	811	ND	74	45	11	0	N	Y	Y	Plants
Unit C	826	ND	75	45	10	2	N	Y	Y	
WCOU	845	ND	75	45	10	2	N	Y	Y	Plants
WCOU	856	ND	75	44	11	2	N	Y	Y	Plants
Unit A Supervisor	859	ND	75	44	10	2	N	Y	Y	
Area Program Mgr.	808	ND	75	44	9	0	N	Y	Y	
Unit C	950	ND	74	46	11	1	N	Y	Y	Plants

µg/m^3 = micrograms per cubic meter ppm = parts per million ND = non detect

Comfort Guidelines//

Carbon Dioxide:	600 - 800 ppm = acceptable	Temperature:	70 - 78 °F
	> 800 ppm = indicative of ventilation problems	Relative Humidity:	40 - 60%

Location: DCF **Indoor Air Results**

Address: 143 Munson St., Greenfield, MA **Table 1 (continued)** **Date: 5/19/2017**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Supply	Exhaust	Remarks
C Unit Mgr.	860	ND	75	44	12	2	N	Y	Y	Plants
Photocopier	827	ND	74	44	8	0	N	Y	Y	Photocopier
WCOU Supervisor	861	ND	74	45	15	0	N	Y	Y	Plant
FRU	896	ND	74	44	9	3	N	Y	Y	
FRA Supervisor	829	ND	74	45	12	1	N	Y	Y	
FRU Supervisor	876	ND	74	44	8	2	N	Y	Y	
Office	826	ND	74	44	7	0	N	Y	Y	
NQ Unit B Supervisor	864	ND	74	44	8	1	N	Y	Y	
Children's storage 02	643	ND	75	44	8	0	N	Y	Y	
Children's storage 01	668	ND	75	45	12	0	N	Y	Y	
Closed files room	624	ND	75	45	10	0	N	Y	Y	
Conference room	615	ND	74	46	9	0	N	Y	Y	

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Comfort Guidelines

Carbon Dioxide:	<800 = preferable	Temperature:	70 - 78 °F
	> 800 ppm = indicative of ventilation problems	Relative Humidity:	40 - 60%

Location: DCF **Indoor Air Results**

Address: 143 Munson St., Greenfield, MA **Table 1 (continued)** **Date: 5/19/2017**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
02										
Conference room 01	610	ND	74	47	12	0	N	Y	Y	
Staff support	623	ND	75	47	10	0	N	Y	Y	
Adoption Unit Supervisor	729	ND	76	45	13	0	N	Y	Y	
Adoption	734	ND	76	44	10	2	N	Y	Y	
Open files room	721	ND	76	43	9	0	N	Y	Y	1 water-damaged ceiling tile
Area Mgr.	782	ND	76	42	8	0	N	Y	Y	
Office	813	ND	76	42	8	0	N	Y	Y	
Office	866	ND	77	42	21	4	N	Y	Y	
NQUB Supervisor	818	ND	76	40	10	1	N	Y	Y	
IUB	800	ND	76	41	8	1	N	Y	Y	
IUB Supervisor	786	ND	76	40	7	1	N	Y	Y	

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Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
IUA Supervisor	783	ND	76	41	10	2	N	Y	Y	
IUA Supervisor	789	ND	75	41	8	0	N	Y	Y	
Area Dir	841	ND	75	41	7	2	N	Y	Y	
SU	791	ND	75	41	8	1	N	Y	Y	
SU Supervisor	778	ND	75	41	7	0	N	Y	Y	
Attorney 1	761	ND	74	41	7	0	N	Y	Y	
Conference room	762	ND	74	41	7	0	N	Y	Y	
Reception	782	ND	74	45	8	3	N	Y	Y	
Nursery	724	ND	74	44	8	0	N	Y	Y	
CV Supervisor	746	ND	74	42	7	0	N	Y	Y	
Clothes storage	748	ND	74	42	8	0	N	Y	Y	
Paper storage	749	ND	74	43	8	0	N	Y	Y	

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Address: 143 Munson St., Greenfield, MA **Table 1 (continued)** **Date: 5/19/2017**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Cubicles	764	ND	74	43	7	4	N	Y	Y	
Office	767	ND	74	43	7	0	N	Y	Y	
Cubicles	790	ND	74	43	8	0	N	Y	Y	Plants
Team room 1	768	ND	73	44	11	1	N	Y	Y	
Team room 2	760	ND	72	43	8	0	N	Y	Y	
CV Supervisor	761	ND	72	44	8	0	N	Y	Y	
Adolescent	657	ND	71	46	10	0	N	Y	Y	
Children	657	ND	72	46	7	0	N	Y	Y	
Interview B	683	ND	71	45	8	0	N	Y	Y	
Interview 3	665	ND	71	46	7	0	N	Y	Y	
Interview A	664	ND	70	47	7	0	N	Y	Y	
Interview 4	656	ND	70	46	8	0	N	Y	Y	

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